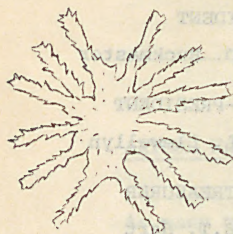




NEWSLETTER

VOLUME 15 NUMBER 3

AUTUMN 1978



AUSTRALIAN SOCIETY FOR LIMNOLOGY NEWSLETTER

VOLUME 15 NUMBER 3 AUTUMN 1978

CONTENTS

3 NEWS

9 OBITUARIES

12 CONFERENCES

15 THESIS SUMMARIES

19 SCIENTIFIC CONTRIBUTIONS

- 19 Report of microsporidial infestation of the
freshwater crayfish, *Cherax destructor*
(I.L. Carstairs)

- 23 A note on *Cordylophora* in South Australia
(B.J. Brock)

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THE AUSTRALIAN SOCIETY FOR LIMNOLOGY

ASL EXECUTIVE 1977-78

The Australian Society for Limnology is an association of over 300 people with professional or amateur interests relating to Australian inland waters. Since its inception in 1961, the Society has played an important role in fostering limnological work in this country. The ASL also promotes liaison between limnologists in academic, private, and governmental institutions, and has a vested interest in the conservation of aquatic and related resources. Annual congresses are held near centres of limnological interest, and the program includes scientific sessions, field excursions, and social activities.

The ASL produces a Newsletter, with notes on activities, articles of general and scientific interest, book reviews, and congress announcements, and an occasional Special Publication. A further periodical publication is the Directory of Australian Limnologists.

Membership applications are welcomed; four classes of subscribing membership are catered for:

- Ordinary members (\$8 pa)
- Student members (\$4 pa)
- Sustaining members (\$50 pa or more)
- Affiliated Bodies (subs. on application)

NOTE: Members are entitled to receive the *Aust. J. Mar. Freshwat. Res.* at a reduced rate (\$7.50).

Subscriptions cover the period 1 July-30 June.

Details are available from:

Dr. B.T. Hart,
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ADELAIDE, S.A. 5001.

* * * * *

Newsletter contributions are always welcome, and correspondence should be addressed to the Newsletter Editor. The next copy deadline is July 1, 1978.

NEWS

ARTHUR HAUGHEY

New Zealand's gain is Australia's loss. As many members will know, Arthur left Australia last year to take up an appointment in Auckland, New Zealand. His new address is given below : both private and professional addresses are given. Both are reproduced from addresses directly supplied by Arthur :

PRIVATE : 8 Pencarrow Avenue,
Mt. Eden, Auckland 3, N.Z.

PROFESSIONAL : Pooh Works,
Mangare,
ARA Private Bag, Auckland 1, N.Z.

AQUATIC PLANTS

An eight page, loose-insert supplement applicable to both the original 1973 printing and the 1977 reprint of Aquatic Plants of Australia (H.I.Aston) has been prepared. It contains updated information on Australian aquatic plant taxa, together with a bibliography, and is automatically included with each copy of the reprint. Holders of the 1973 printing may obtain a copy of the supplement free of charge from Melbourne University Press, P.O. Box 278, Carlton South, Victoria, Australia 3053.

Self-addressed envelope (10 inches x 7 inches) MUST accompany application.

CURRENT MEMBERSHIP

Current ASL membership stands at 326 members, 57 libraries and 2 sustaining members.

SALVINIA NOW IN SEPIK FLOOD PLAIN, PAPUA NEW GUINEA

Salvinia has recently been reported from the Sepik Flood Plain between Angoram and Ambunti where the surface area covered was estimated at about 3165 hectares. It is regarded as a potentially serious hazard to the fishery. It was first sighted as a mass of floating vegetation in the main Sepik River channel and oxbow lakes. Samples have been identified as probably *S. molesta*.

Reports from river dwellers (personal communication), indicate that in some areas in the Sepik Flood Plain *Salvinia* has become a negative economic factor in the subsistence and commercial fisheries. Floating colonies of *Salvinia* affect the setting of gill nets and make navigation by motorised canoes difficult. The appearance of *Salvinia* in this area is very important at this time because the Government of Papua New Guinea in conjunction with ADB is undertaking a development project in a salted fish industry based on *S. mossambica* stocks.

(From J. Glucksmann, Department of
Primary Industry, Papua New Guinea.)

ASL PROJECT AQUA SITES

Ian Campbell (c/- Water Studies Centre, Caulfield Institute of Technology, P.O. Box 197, Caulfield East, Victoria 3145) communicates the following.

"As most members are aware, the Society established a "Project Aqua" committee at the A.G.M. in Canberra in 1975. The purpose of this committee was to draw up a list of limnological sites which the Society believes should be conserved, principally for scientific or educational reasons.

In 1976 Bill Williams was approached by the National Estate Enquiry, and invited to prepare such a list for the Australian Government. As a result, Bill and the Society's committee contacted a member living in, or with knowledge of, each State or territory, and requested that they in turn contact other members in their regions to contribute to such a list.

The National Estate Enquiry was replaced by the Australian Heritage Commission in 1976, and the new body decided to compile a register of sites which should be conserved for various reasons (historical, aesthetic, scientific, etc.). This compilation is currently proceeding.

Lists of sites recommended for conservation by the Society have been drawn up for Victoria and New South Wales. These lists have been forwarded to the Heritage Commission and are currently being considered for the Commission's list. I believe that most of the sites listed by the Society will be accepted by the Commission. In addition to this list, Peter Tyler has provided the Commission with a list of Tasmanian sites; but I understand that the Commission has not received lists from the other States or Territories - a situation which must be of concern to all members.

The Commission is still soliciting recommendations. Persons wishing to propose sites can do so on forms which can be obtained from me, or from

Warren NICHOLLS,
Australian Heritage Commission,
P.O. Box 1567,
CANBERRA CITY, A.C.T. 2601.

If members do send recommendations directly to the Commission, I would appreciate copies of the submissions, so that the Society can maintain its own independent list. Listing by the Heritage Commission may be a valuable weapon in the protection of important limnological sites."

SOCIETAS INTERNATIONALIS LIMNOLOGIAE

Copies of the minutes of the International Committee meetings held in Copenhagen, Denmark, August 1977 have been made available to Dr. P.A. Tyler, the Australian National Representative. Some points of interest are the following :

Future Congresses:

Prof. S. Mori, Chairman of the Organization Committee, presented the formal invitation and summary of the plans for the 21st Congress of SIL, to be held in Kyoto, Japan, 24-31 August 1980. An attractive printed preliminary announcement was available for all members on themes and scientific excursions. Approved with acclamation.

Prof. Dussart reviewed the preliminary invitation to hold the 22nd Congress in France. The Congress would convene in Lyon and have themes focusing on the stability and evolution of aquatic systems, hydrographic research, the impact of human activities on fresh waters, and aquaculture. A number of tentative scientific excursions are planned throughout France. Approved with acclamation.

Baldi Memorial Lecturer: Sec. Wetzel announced the conclusion of the Baldi Memorial Committee that Prof. S. Horie be requested to present the distinguished lecture at the 21st Congress. Approved with acclamation.

Other Officers and Committees: The following list of persons were proposed for election or reelection; approved.

- a. Assistant to the Treasurer: Prof. Dr. E.A. Thomas
- b. Naumann-Thienemann Medal Committee: Profs. Hutchinson, Kuznetsov, Mortimer, Ohle, Rodhe, Winberg, Steemann Nielsen
- c. Baldi Memorial Committee: Profs. Tonolli, Frey, Winberg, Hynes
- d. Auditors: Profs. R.C. Ball and F.F. Hooper
- e. Deputy Auditors: Profs. D.G. Frey and G.H. Lauff
- f. Arbeitsgemeinschaft Donauforschung: Prof. R. Liepolt
- g. International Association for Great Lakes Research: Dr. A. Robertson

National Representatives: Newly elected or reelected National Representatives of SIL were approved as follows: (only those from Australia and New Zealand given here).

Australia: Dr. P.A. Tyler

New Zealand: Dr. C.W. Burns

Symposia: Sec. Wetzel had received a number of requests for endorsement by SIL of planned symposia and reports of on-going symposia committees.

- a. African Limnology: Prof. Symoens reported that groups of interested persons met several times during the Congress and recommended *inter alia* that the meeting on African limnology take the form of a workshop to be held in Africa sometime in 1979.
- b. Working Group on Comparative Limnology of Great Lakes: Dr. Robertson reported the results from meetings with interested persons. It was concluded that workshops on Great Lakes limnology would preferably remain separate from the general symposium on African limnology and that it is premature to formulate a symposium on Great Lakes limnology at this time. Dr. Robertson will explore the possibility of developing a working group.
- c. Third International Symposium on Paleolimnology: Financial support has been received from the Finnish Ministry of Education to host this symposium in Finland in 1981; D.G. Frey and J. Meriläinen, co-chairmen. Approved.
- d. Mass Culture of Microalgae: To be held in Israel, July 1978; C.J. Soeder, Chm. Endorsement approved.
- e. The Effect of Human Activities on the Ecology and Sedimentation of Lakes and Reservoirs: To be held in conjunction with the 10th International Congress on Sedimentology, July, 1978 in Israel; C. Serruya, Chairperson. Endorsement approved.

- f. 50th Anniversary of the Freshwater Biological Association: Mr. D. LeCren, Chm.; requested approval of a Jubilee Symposium on the theme of changes in fresh waters and the contributions of the FBA to limnological developments. Co-sponsorship by SIL approved with acclamation.
- g. Inland Saline Lakes: Australia, 1978, W.D. Williams Chm.; SIL endorsement approved.
- h. Second International Symposium on Rotifers: Site to be established, August 1979; A. Ruttner-Kolisko, Chairperson; SIL endorsement approved.
- i. Symposium on Planktonic Interactions and Modeling: Site to be established, April 1978; A. Duncan, Chairperson; SIL endorsement approved.
- j. First International Symposium on Oligochaetes: Canada, 1979; R. Brinkhurst, Chm. SIL endorsement approved.

FORTHCOMING BOOK ON AUSTRALIAN WATER RESOURCE MANAGEMENT

Australian National University Press, Canberra, have recently accepted for publication a book edited by Bill Williams entitled: "An Ecological Basis for Water Resource Management". As the name suggests the book is largely about applied aquatic biology. There are 35 chapters in all divided into seven sections: (1) the nature of the resource, (2) management problems, (3) water usage with particular reference to water quality criteria, water supplies and wastewater, (4) impact of man, (5) useful or undesirable fauna, (6) case-studies of man-made lakes, (7) special aquatic environments. Publication is expected about March 1979, and both soft-back and hard-back versions will be published. Approximate cost: less than \$20! Further information will appear in a subsequent Newsletter.

SENATE STANDING COMMITTEE ON NATIONAL RESOURCES

A standing committee of the Senate is presently investigating Commonwealth involvement in Australian water resources. The findings of this most important committee are expected later this year. Meanwhile, for those who cannot wait to read all about it, reference should be made to the Official Hansard Reports. These, it should be added make most interesting reading. For example, here is what one extremely important State personality had to say about water research:

"I, for example, hold that a lot of water research is too ethereal and high flying and results in too many words and too many mathematical equations."

THE NOOSA RIVER AND THE COOLOOLA NATIONAL PARK

Your editor has recently received a booklet (National Library of Australia, Card Number and ISBN 9597004. 1. 2) written by Dr. A.G. Harrold for the Cooloola Committee and the Noosa Parks Association entitled: *"The Case for the Western Catchment of the Noosa River to form part of the Cooloola National Park."*

A strong case is made for the extension of the Cooloola National Park. Interested readers are advised to contact the Cooloola Committee directly: P.O. Box 238, North Quay, Queensland 4000.

IAN CARSTAIRS

Our most intrepid traveller has temporarily forsaken us. He left Darwin March this year for Scotland (via Indonesia and Malaysia). In Scotland Ian is planning to take a Diploma in Aquaculture at Stirling University. His address until Sept. 1979: Siwardlea, Siward Lane, Ecie, Fife, Scotland. He will also present a paper this August at the International Society of Astacology which meets in France at that time.

OBITUARIES

JOHN LAKE

As briefly intimated in the last Newsletter, the Society recently lost one of its founding fathers and towers of strength. John Lake died after a short illness (lung cancer) on 5 December 1977.

John graduated B.Sc. from the University of Sydney in 1949, and obtained an M.Sc. for work in organic chemistry in 1952. However, John's professional inclinations were more biological than chemical and in 1949 he joined the N.S.W. State Fisheries as a biologist. He worked on an evaluation of N.S.W. trout populations for the next 6-7 years, publishing an account of his studies in 1957. Then, working in the Bourke-Brewarrina area, John commenced work on the life cycles of native freshwater fish. This and later work culminated in the publication of many pioneer studies. From 1960-1966 he was officer-in-charge of the Inland Fisheries Research Station at Narrandera. Whilst there he successfully induced the spawning of the Murray Cod, golden perch and other species, and accurately recorded for the first time factors which cause spawning in these species. In 1966 he moved to Sydney to take up the position of Senior Lecturer in the Department of Biology, University of Sydney. His interests in the reproductive biology of fish continued but now, no longer bound by State limits, he travelled widely in Queensland. It was largely whilst at Sydney, that John wrote his exceedingly valuable book *"Freshwater Fishes and Rivers of Australia"* published by Thomas Nelson in 1971. Shortly before its publication he became Director of Forestry, Fisheries, Wildlife and National Parks for the Northern Territory. Based in Darwin, he became administratively responsible for a large portion of the natural resources of the Northern Territory. In December 1974, cyclone Tracy struck. To those members of the Australian Society for Limnology who spoke with John about the events of that time, it will be known that the Lake family had clearly been subjected to a trauma unlike any that most Australians experience. It had a profound effect: immediately after the cyclone, John and his family left Darwin to seek quieter, less tumultuous pastures. They found them at Lismore in the north-east of N.S.W. And it was there that John joined the staff of the Northern Rivers College of Advanced Education and built a new home for his family on a large block of land a short distance outside the town. It was there also that John found his last resting place.

John played a fundamental role in the foundation of the Australian Society for Limnology. He occupied almost every executive position which exists and was

President for two years. With John's demise the Society loses a senior member on whom it could always call for support. And I, the editor of the Society's Newsletter, lose a good friend and a valuable professional colleague.

VALE! John.

W.D.Williams

GERALD PROWSE

Gerald/Albert Prowse was born in Bembridge, Isle of Wight, U.K., on July 21, 1916. He passed away peacefully in late 1977 in Hawaii, U.S.A. Educated in Tottenham County School, he went on to Birbeck College, University of London where he received his B.Sc. and Ph.D.

He taught in various places including Turkey, the U.K. and Khartoum before finally taking a position as scientific officer with the Colonial office of the U.K. in 1956 and a posting to The Tropical Fish Culture Research Institute, Batu Berendam, Malacca, Malaysia. Subsequently, in 1959, he was appointed Director of the Institute, a post he held until 31 December 1970 when the Institute was passed by the British Government to the Malaysian Government. His extensive service to fish-culture research during this period were recognised in 1971 when he was awarded the OBE.

In 1971, Professor Prowse took up the chair of Zoology at Lasotha University, Bostwana. southern Africa. He left a year later to take up part-time teaching in the University of Hawaii where he was to spend his final days.

Although Gerry Prowse was a botanist by training, he was keenly interested in tropical fish culture, an interest which led him to join the Malacca Institute when it was first founded. His research activities were mainly centered on the desmids of Malaysian waters and the role of phytoplankton in fish productivity. Through him, progressive and standardised methods of fish culture were evolved. It was this work that won him greatest international recognition.

In spite of busy research activities, Gerry found time to participate in various social and scientific activities. He was a member of the Malacca Rotary Club and was its president twice during his fifteen years with the club. Under him, the club provided the Malacca General Hospital with its first Intensive Coronary Care Unit. He was also the founder-fellow of the International Society for Ichthyology and

Hydrobiology, and a member of the FAO Steering Committee for the 1966 World Symposium on fish culture. In addition, he attended numerous scientific meetings and symposia around the world.

Professor Prowse was a sympathetic, kind and generous man. By the many people he has helped and the many who knew him well, his absence will be strongly felt.

For those interested in his scientific work, a list of publications and reprints may be obtained from the librarian, The Freshwater Fisheries Research Station, Mardi, Batu Berendam, Malacca, Malaysia.

Lee Chan Lui

CONFERENCES

INTERNATIONAL SYMPOSIUM ON URBAN STORM WATER MANAGEMENT

The Fifth International Symposium on Urban Storm Water Management is being planned for July 24-27, 1978, at the University of Kentucky in Lexington, U.S.A. The symposium is aimed mainly at engineers, but much of material to be presented will be of interest to practising limnologists also. Further information : Ms Elizabeth Haden, Symposium Coordinator, Office of Continuing Education, College of Engineering, University of Kentucky, Lexington, Kentucky 40506.

SYMPOSIUM ON FIRE AND THE AUSTRALIAN BIOTA

Over evolutionary time natural fire has played a major role in determining the life histories of species occupying fire prone ecosystems. The effects of human modification of fire frequency and intensity have been super-imposed on this interaction between natural fires and the ecosystem. So far as the aquatic environment is concerned, the impact is chiefly manifest through alterations to the hydrological behaviour of catchments.

The symposium will take place in Canberra 9-11 October 1978, and is being organized by the Australian Academy of Science. Further information and details may be obtained from :

Symposium on Fire and the Australian Biota
Australian Academy of Science
PO Box 783
Canberra City ACT 2601.

SECOND INTERNATIONAL CONFERENCE ON TOXIC DINOFLAGELLATE BLOOMS

The second international conference on toxic dinoflagellate blooms will take place October 31 to November 5, 1978, at the Sonesta Beach Hotel, Key Biscayne, Florida, U.S. There will be three sessions: I, Organisms; II, Environments (including data on non-toxic blooms); III, Toxins and Pharmacology. Though toxic blooms of dinoflagellates are primarily a marine phenomenon, the group occurs in both the marine, estuarine and freshwater environment. The symposium will not be without interest therefore to limnologists.

Further details:

Ms. Carrie Lewis, Coordinator
 Bigelow Laboratory for Ocean Sciences
 West Boothbay Harbor
 Maine, U.S.A. 04575.

INTERNATIONAL SYMPOSIUM: THE AGRICULTURAL INDUSTRY
AND ITS EFFECTS ON WATER QUALITY

This important symposium, organized by the New Zealand Committee for Water Pollution Research and the Royal Society of New Zealand, is to be held in Hamilton, New Zealand, 15-18 May, 1979. Three major topics will be discussed:

1. Characterisation, Treatment and Disposal of Wastes from Agriculture (including the processing industries).
2. Agricultural land use and its effects on catchment outputs. (Water quality and quantity).
3. Changes in freshwater systems caused by outputs from agricultural catchments.

Papers on the above topics are invited for presentation at the Symposium. As preprints will be issued, 30th September 1978 will be the final date for the submission of papers.

PROVISIONAL REGISTRATION AND ALL CORRESPONDENCE:

Dr. C.J. Schouten,
 Water and Soil Division,
 Ministry of Works and Development,
 Private Bag,
 Hamilton,
 New Zealand.

INTERNATIONAL CONFERENCE ON DEVELOPMENTS IN LAND METHODS
OF WASTEWATER TREATMENT AND UTILIZATION

This conference is being held under the auspices of the International Association on Water Pollution Research with co-sponsorship from a number of Australian bodies. It will take place October 23-27, 1978, with technical sessions at the University of Melbourne, Melbourne. The conference will be concerned with irrigation, grass filtration (overland flow) and lagoons (stabilisation ponds) as used in the treatment and utilisation of wastewater (including sludges) and will include keynote addresses and submitted research papers covering aspects of design and operation, effectiveness of processes, reclamation of water, public health, animal health, effluent and sludge disposal together with an inspection tour of the Werribee Farm.

FURTHER INFORMATION AND DETAILS:

IAWPR Conference Secretary
Melbourne and Metropolitan Board of Works
Box 4342, G.P.O.
Melbourne, 3001.

(N.B. The Registration fee is \$120.00).

THESIS SUMMARIES

Dr. Sam Lake has forwarded the following summaries of B.Sc. Honours Theses in limnology completed in the Department of Zoology, Monash University, November 1977.

A STUDY OF THE INVERTEBRATE FAUNA OF FARM DAMS WITH SPECIAL REFERENCE TO PREDATION BY *Gambusia affinis affinis* (BAIRD AND GIRARD)

by

Elizabeth M. Croxford

The invertebrate fauna of farm dams was studied with particular emphasis on the effects that fish predation may have on farm dam communities. Two pairs of similar dams were studied - one dam in each pair having a resident population of *Gambusia affinis affinis* (Baird and Girard) 1854 and the other dam without fish.

Quantitative samples of invertebrates were taken from five habitats in each dam; littoral vegetation, littoral open water, benthos at depths less than 2 metres, benthos at depths greater than 2 metres and the limnetic region. All five habitats were shown to have different assemblages of animal species. The fauna of the vegetated areas had a greater number of species and a greater overall abundance than that of open water areas. Benthos was found to have a greater number of species and a greater overall abundance than have previously been reported for farm dams.

In comparisons of the fauna of fish and non-fish dams, it was found that the population of zooplanktonic species had been depleted in one fish dam but not in the other. Overall abundance of invertebrates in the littoral open water fauna was lower in fish dams. Notonectids in particular were found in lower numbers in fish dams and *Gambusia* may have outcompeted them with food being the limiting factor. The standing crop of benthos at depths less than two metres was found to be reduced in fish dams.

The type of ecosystem destruction that has previously been attributed to *Gambusia* was not observed in the farm dams. It was also noted that *Gambusia* were not having a readily apparent, detrimental effect on *Nannoperca australis australis* Gunther. It was suggested that *Gambusia* populations are being limited by a temperature requirement for breeding. They may also be limited by predation by perch (*Perca fluviatilis* L.) in one of the dams studied.

AN INVESTIGATION OF THE DISTRIBUTION OF AQUATIC
MACROINVERTEBRATES FOUND IN SECTIONS OF STREAMS
FLOWING THROUGH AREAS WITH DIFFERING AMOUNTS
OF VEGETATION COVER

by

Leon H. Metzeling

The aquatic macroinvertebrate fauna found in sections of streams with differing amounts of riparian vegetation was investigated.

On the basis of having the desired sequence of vegetational changes, two fourth order streams, Beer and Britannia Creeks were selected. Three sampling stations along each creek were chosen - one in the natural bush-land, the second in an area of intermediate vegetation cover, and the third in the cleared area, an area with little or no tall bankside vegetation.

The benthos of each creek was sampled during March (summer) and September (winter) using a Surber sampler. The drift fauna at each section of both creeks was sampled during summer, but only Beer Creek was sampled during winter.

The concentrations of the major cations in the creeks were measured. Measurements of substrate particle size showed an increase in the proportion of finer sediments from the natural to cleared section. The change in substrate was attributed to increased erosion due to cattle grazing.

Measurements of light intensity at the stream surface show a ten-fold increase in the clear section as opposed to the natural section. The only aquatic macrophyte growth was observed in the cleared section, presumably due to the increased light availability.

Stream temperature measurements showed a variable response to clearing. Daylight temperatures measured during benthic sampling consistently showed a higher maximum and a greater range in temperature in the cleared section as opposed to the natural section, which experienced little change in daily temperature. Twenty-four hour temperature cycles were more variable, particularly in Britannia Creek. Beer Creek consistently showed a difference between the cleared and uncleared sections, but no difference between the cleared and intermediate sections.

The benthic fauna was depauperate in terms of numbers of individuals, yet showed a high species diversity. Comparisons between sections showed no significant differences in population density, number of species, species richness or species diversity. However, similarity comparisons between sections showed a high degree of species change. This effect was more pronounced during summer than winter.

The results from drift sampling Britannia Creek were not discussed due to incomplete sampling. The drift sampling in the three sections of Beer Creek showed marked differences in number of the drift fauna. No difference was observed during the winter drift sampling.

The results indicate a correlation between amount of vegetation cover and the distribution of some taxa; these being chironomids, amphipods, oligochaetes, plecopterans and rhyacophilid trichopterans. Ephemeropterans appear unaffected. Possible reasons for the observed distribution of these animals are discussed.

THE STUDY OF THE INVERTEBRATE FAUNA OF THREE MOUNTAIN STREAMS IN RELATION TO THE TYPE OF LAND USE IN EACH OF THE THREE STREAM CATCHMENTS

by

David P. Robinson

A survey was made of the invertebrate fauna of three small mountain streams in the Coranderrk experimental catchment near Healesville, Victoria. The three streams studied are a part of a long term hydrological study by the Melbourne and Metropolitan Board of Works on the effects of two types of logging activities on stream water quantity and quality.

The drift fauna of each creek was sampled once during the year in late summer. The density of the drift in any of the creeks was relatively low. The two dominant organisms in the drift were a mayfly nymph (*Atalophlebioides* sp.) and an amphipod (*Pseudomoera gabrieli*), both of which showed marked diurnal periodicity in their drifting behaviour with the greatest activity being at night.

Samples of the benthic fauna were collected from a number of sites on each of the three creeks at two times of the year (April and August, 1977). Each of the three creeks was found to have a similar fauna in terms of the species present but the fauna of each creek differed in terms of the dominant species present. The creek in the natural unlogged state (Slip Creek) was found to have the greatest densities of oligochaetes and gastropods (Family Bithyniidae). Almost half of the total numbers of individuals collected from Slip Creek were oligochaetes. The densities of oligochaetes in Slip Creek were about ten times those found in the other two creeks in which logging activities had taken place.

A large increase in the total density of invertebrates from summer to winter was observed in all three creeks.

SCIENTIFIC CONTRIBUTIONS

REPORT OF MICROSPORIDIAL INFESTATION OF THE FRESHWATER CRAYFISH, *Cherax destructor*

by I.L. CARSTAIRS

(P.O. Box 103, Kyneton, Victoria 3444)

Introduction

The occurrence of the microsporidial parasite, *Thelohania* sp., is reported for the first time from two locations in Victoria and one location in New South Wales, Australia. These are the first reports of this freshwater crayfish parasite from the southern hemisphere. Infected specimens are recognised by a characteristic milky appearance on the underside of the abdomen. It is likely that *Thelohania* parasitizes *Cherax destructor* throughout the five-State range of this crayfish. *Thelohania* spp. have caused considerable ecological and economic damage (up to 30% mortality), among four genera of freshwater crayfish in Europe. This parasite genus is well distributed in the northern hemisphere: France (Henneguy & Thélohan, 1892; Vey & Vago, 1972; Maurand & Vey, 1973), Germany (Schäperclaus, 1957), U.K. (Cossins, 1972), Finland (Sumari & Westman, 1969), U.S.A. (Unestam, 1972), and U.S.S.R. (Voronin, 1971).

The occurrence of a pathogen, such as *Thelohania*, in a high density fish farm is a serious matter. The rate of transmission of this disease is all the higher, as it is likely that a secondary host is involved (Cossins, 1972). The discovery of this protozoan parasite strengthens the case for banning the live export of freshwater crayfish from Australasia as soon as possible (Carstairs, 1975).

Henneguy and Thélohan first noted the characteristic milky appearance of infected freshwater crayfish muscle in 1892. Since then many European authors have noticed the symptoms of *Thelohania* infection which are externally visible in the advanced stages, but are not easy to recognise without dissection in the early stages (Cossins, 1972). The crayfish abdominal muscle is normally translucent (Cossins, 1972).

The disease is transmitted when a dead infected crayfish is eaten by other crayfish (Cossins, 1972). *Thelohania* spores are activated by the new host's digestive juices, and sporoplasm invades the

host through the gut wall (Cossins, 1972). Rapid schizogony of protozoan spores within the host muscle results in death of the crayfish and dispersal of the spores (Cossins, 1972). It has been reported that there is transmission of the disease via the eggs (Voronin, 1971).

Methods and Observations

Sampling was restricted to commercial, meat-baited, double-entranced creels. The infestation level amongst *Cherax* with milky abdominal muscles was monitored over a two year period at Mitre, when approximately 500,000 *Cherax* (between 5.5cm and 17.8cm total body length) were handled (March 1976 to January 1978). No berried females were found with external signs of *Thelohania* sp. infestation, and one infected female *Cherax* remained surprisingly vigorous for seven months in an aquarium, before dying.

Results

Infected *Cherax* were first discovered in the catch at my commercial crayfish farm at Mitre, Victoria, Australia, in March 1976. A search of the available literature led to electron micrographs of infected muscle tissue being taken, and these fitted the descriptions and pictures in the 1972 papers of Cossins, Vey and Vago.

Dr. Vey confirmed that mature spores and stages of schizogony and sporogony of a microsporidia can be recognised in the micrographs, as can four spores inside the same pansporoblast membrane (Vey, 1977). Groups of eight spores in the sporoblast were found in the histological section that I forwarded, and this confirmed that the parasite of *Cherax* is a microsporidian of the genus *Thelohania* (Vey, 1977).

Details of Infestation

Date	Area	Water	% Infestation	Size Range
March 1976	Quinans Swamp, Mitre, Victoria	170H Terminal Lake	10%) over) 500,000) sampled	5.5-17.8 cm T.B.L.
Jan. 1978	" "	" "	1%)	
Nov. 1976	Ardwick Swamp, Bringalbert Sth, Victoria	35H Terminal Lake	14%) over) 1,000) sampled	10.5-21.0 cm T.B.L.
Jan. 1978	" "	" "	10%)	
Feb. 1977	Menindee, N.S.W.	Darling River	20% - 5 sampled	12.5-18.5 cm T.B.L.

The fixing and staining technique for the electron micrographs was that of Cossins (1972). The material was fixed in 5% glutaraldehyde, postfixed in 1% osmic acid (both on 0.1M sodium cacodylate buffer, pH 7.3) and embedded on epon. Thin sections were stained with lead citrate and uranyl acetate (Cossins, 1972).

Discussion

An infestation level of about 10% was first recorded at Mitre, but this has since declined to about 1% (January 1978). Heavy fishing has thinned out the *Cherax* population over this period. The infestation level could thus be density dependent, which has serious implications in relation to the development of intensive freshwater crayfish farming. The sampling method selected the larger and healthier individuals in the population, and the real infestation level is therefore significantly higher than the measured level. Infected individuals with advanced *Thelohania* infestation had a noticeably weaker tail flick than uninfected specimens, and the infected *Cherax* usually died within three days of leaving the water and travelling to market in damp sacks.

The discovery of this parasite adds more weight to the case for banning the live export of freshwater crayfish for the purpose of selling, or introducing animals to the freshwater systems of other countries (Carstairs, 1975).

Thelohania contejeani is impossible to detect by cursory external examination in the early stages, which is the current method of veterinary inspection prior to export. Infected yabbies can be transported by migrating ducks, pelicans, cranes, cormorants and plovers, as well as in the digestive tracts of apparently healthy migrating yabbies (*Cherax destructor*).

Importing countries such as France, Germany and Finland are unlikely to risk importing a potential killer of their native freshwater crayfish. Their native crayfish stocks have already been seriously depleted by *Aphanomyces* and *Thelohania* spp. (among other diseases). Many experts in this field agree that this protozoan is of ecological and economic significance (Unestam, 1972, 1975; Sumari and Westman, 1969; Vey and Vago, 1972; Maurand and Vey, 1973; Cossins, 1972; and Schäperclaus, 1957). The lessons from the U.S.A. in this regard should be well heeded. Live American freshwater crayfish introductions and exports (*Procambarus*, *Pacifastacus* and *Orconectes* spp.) have disrupted the ecology, agriculture and economics of at least six widely separated countries in both hemispheres (Carstairs, 1975). Yet the power of the 'fast buck' in the U.S.A. has meant that this export still continues, despite overwhelming evidence of the damage it has caused in the past. We are still in the "dark ages" so far as the priority of export earnings overshadows environmental impact and efforts to increase world protein production.

As a commercial fishfarmer interested in increasing per capita fish consumption, I can vouch that the short term profit is not worth the long term and indefinite risk.

It is my hope that the discovery of this parasite in Australia will lead to rapid enforcement of responsible legislation to prevent the live export of freshwater crayfish from Australasia.

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A NOTE ON *CORDYLOPHORA* IN SOUTH AUSTRALIA

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of Advanced Education, Adelaide)

The survival of some microscope slides of *Cordylophora* (Cnidaria) prepared by E.J. Bradley early this century, and labelled as from the Murray River and Hindmarsh River, indicate that *Cordylophora* has previously been seen in South Australia. Its presence in the State, however, is by no means common; it has, for example, never been noticed by the author during twenty-five years field collecting until recently. The following records of it, therefore, are of some interest :

28. v. 1977 Light River, near Stockport, S.A.
3. iii. 1977 River Torrens, near Underdale,
Adelaide.
11. ix. 1977 Murray Lagoon, Kangaroo Island,
S.A.

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